243 Assessment of the influence of air flow on the volume of NaCl 0.9% remaining in eFlow® aerosol chamber after completion of inhalation

Z. Podolec[1], J. Siekaniec[1]. [1]*Dept. of Aerosology and Aerosol Bioengineering, Research and Development Centre MEDiNET, Cracow, Poland*

Introduction: eFlow® rapid nebulizer is widely used in clinical trials and medical practice in treatment of cystic fibrosis. Reason for research was the patients' observation that after finishing of inhalation the certain volume of drug remains in nebulizer's aerosol chamber. The aim of the research was to assess the influence of the constant air flow on the volume of NaCl 0.9% remaining in aerosol chamber after automatic termination of inhalation.
Method: eFlow® nebulizer was connected with the source of constant air flow: 30, 60, 90 L/min until the automatic end of inhalation of 5 ml NaCl 0.9%. The volume of NaCl 0.9% in aerosol chamber was measured by weight method. That method consists in comparison of the weight of the aerosol chamber before and after the end of inhalation.
Results: The statistically significant influence of constant air flow on amount of drug in aerosol chamber which equaled to 0.526, 1.165 and 1.342 g for air flow 30, 60 and 90 L/min respectively was stated. Our study demonstrate that constant air flow through eFlow® causes a loss of drug in aerosol chamber the size of which depends on the volume of air flow. eFlow® is ventilated nebulizer. The probable reason of drug retention in aerosol chamber is vacuum pressure which depends on the inspiratory valve resistance and volume of air flow. That vacuum pressure can cause partial loss of ability to produce drug by nebulizer. Influence of flow on the quality of aerosol during aerosol inhalation was stated in varying degrees in all ventilated nebulizers.
Conclusion: Aerosol inhalation using ventilated nebulizers requires detailed explanation of the optimal method of inhalation to the patient.

244 Assessment of the influence of air flow through the eFlow® on the quality of the aerosol of rhDNase, budesonid, salbutamol and NaCl 0.9%

Z. Podolec[1], J. Siekaniec[1]. [1]*Dept. of Aerosology and Aerosol Bioengineering, Research and Development Centre MEDiNET, Cracow, Poland*

Introduction: The aim of the study was to assess the influence of the constant air flow through the aerosol's chamber on the aerosol's dose and particle size.
Method: Aerosol's dose and particle size was measured by laser diffraction method for 1 min using constant air flow through aerosol chamber equal to 30, 60 and 90 l/min respectively. The effect of air flow on the distribution of aerosol particles of rhDNAse, budesonid, salbutamol and NaCl 0.9% has been evaluated. The dose value and MMAD have been calculated from 10 measurements.
Results: Statistically significant and proportional to increase of air flow, decrease in dose and particle size was stated for all drugs. MMAD values dependent on air flow (30, 60, 90 l/min) equaled to: for rhDNase: 2.91, 1.21 and 0.51 μm; for Salbutamol: 2.89, 0.80, 0.51 μm; for NaCl 0.9%: 2.93, 0.83 and 0.50 μm respectively. For Budesonid MMAD values equaled to 2.97, 1.05 μm for air flow 30 and 60 l/min, whereas for air flow 90 l/min the presence of particles was not recorded by particle counter. Our study demonstrates that constant air flow through electronic eFlow® nebulizer has a significant influence on the aerosol's particle size and on mass of inhaled drug. Adjustment of the size of aerosol's particles to the flow of inhaled air could be really interesting to obtain an increase of aerosol's deposition in the respiratory tract if the dose would not decrease.
Conclusion: It is recommended to make changes in the design of the nebulizer and to broaden the scope of research in order to use in practice possibilities of adaptation of quality of aerosol to the patients' breathing pattern.

245 Hyaluronic acid improves tolerability of hypertonic saline in CF patients

P. Buonpensiero[1], F. De Gregorio[1], A. Sepe[1], A. Di Pasqua[1], P. Ferri[1], M. Siano[1], V. Raia[1]. [1]*Università degli Studi di Napoli Federico II, Pediatrics, Naples, Italy*

Question: Inhaled hypertonic saline (HS) improves lung function and decreases pulmonary exacerbations in people with cystic fibrosis (CF). However, side effects such as cough and airway narrowing cause intolerance of the therapy in 8% of patients. We aimed to test the effect of the addition of 0.1% hyaluronic acid to HS on side effects.
Aim of the study: Evaluate safety and tolerability of 0.1% HA added to HS administered to patients with CF older than 6 years.
Methods: 30 CF patients (age 13.3±0.5, FEV1 86.7±0.4, BMI 19.4±0.4) treated twice-daily with inhalation of 7% HS were randomized to inhale 7% HS or HS solution added to 0.1% HA on the following day, in a single blind cross-over design. All participants rated following symptoms: cough, throat irritation, saltiness with a 4-point ordinal score from absent to severe. Also rated pleasantness of the treatments using a 5-level, Likert-type scale from very unpleasant to very pleasant.
Results: Significative difference of scores were found in patients treated with HS and HA vs HS alone ($p < 0.05$). *Cough:* HS induced cough in 27/30 patients (90%). HS with HA induced cough in 13/30 patients (43%). Throat irritation in 22/30 (73%) after HS. Throat irritation in 4/30 (13.3%) after HS with HA. *Salty taste*: All patients treated with HS referred salty taste, only 3/30 (10%) with HS+HA. Patients showed pleasantness significantly higher when treated with HS added to HA (3.0±0.2 vs 4.45±0.1).
Conclusion: HA added to HS is generally safe and well tolerated. This novel approach could be a new tool for improving compliance to treatment with HS in collaborative patients with CF. Clinical trials are needed to support our results.

246 Changes in treatment time and adherence to nebulised treatment in children with CF using the target inhalation mode of their adaptive aerosol device

M. Tabberner[1], W. Nixon[1], S. Saunders[1], S. Ollerton[2], M. Travers[2], M. Desai[1]. [1]*Birmingham Children's Hospital, Department of Respiratory Medicine, Birmingham, United Kingdom;* [2]*Profile Pharma Ltd, Chichester, United Kingdom*

Objectives: Poor adherence to nebulised treatment is a well-recognised problem in the management of pulmonary disease in children with CF. Adaptive aerosol delivery (AAD) devices reduce treatment times and may aid adherence. Nebulisation time can be reduced further in the I-neb™ AAD device by improving inhalation technique using a TIM (target inhalation mode) mouthpiece. This controls maximum inspiratory flow, setting targets to be achieved on each inhalation via a vibration, encouraging longer, slower breaths, thereby reducing total nebulisation time. The effect of introducing this device on adherence in children was investigated.
Methods: I-neb™ usage data for children with CF attending the Birmingham Children's Hospital, UK was collected. Data was downloaded from the device for the 3 months prior to the new TIM mouthpiece being demonstrated and fitted and for the subsequent 3 months.
Results: Prior to the change of mouthpiece, average duration of treatment in the 20 children (9M:11F) (median age 12.3 yrs: range 8.3–17.3 yrs) was 8.9 minutes. Median adherence was 88% of total treatments prescribed (range 4–102%). After the TIM mouthpiece was introduced, average treatment time was significantly reduced to 4.45 minutes ($P < 0.001$). Median adherence was 88.5% (range 57–100%). There was a more marked improvement in those with adherence <90% at the start although this did not reach statistical significance.
Conclusions: A change in the pattern of inhalation using an AAD significantly reduces nebulisation times. This impacts positively on the burden of treatment and may also improve adherence particularly in those patients who are less adherent to their treatment.